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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



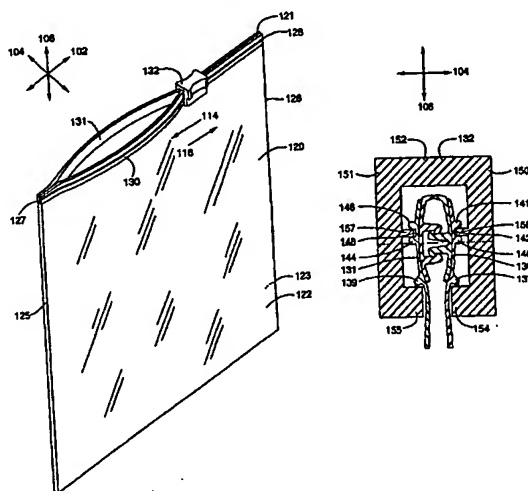
(43) International Publication Date
7 February 2002 (07.02.2002)

PCT

(10) International Publication Number
WO 02/09549 A1

- (51) International Patent Classification: **A44B 19/16, B65D 33/16, 33/24**
- (21) International Application Number: **PCT/US00/20422**
- (22) International Filing Date: **27 July 2000 (27.07.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
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- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).**
- Published:
— with international search report
- (74) Agents: **AUGUSTYN, John, M. et al.; Leydig, Voit & Mayer, Ltd., Suite 4900, Two Prudential Plaza, 180 North Stetson, Chicago, IL 60601-6780 (US).**
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **CLOSURE DEVICE**



(57) Abstract: The closure device (121) includes first and second fastening strips (130, 131) and a slider (132) slidably disposed on the fastening strips (130, 131) for facilitating the occlusion and deocclusion of the fastening strips (130, 131). The first fastening strip (130) includes a first rib (140) and a first end stop (127) near the first rib (140). The slider (132) includes a first protrusion (156). The first protrusion (156) engages the first end stop (127) when the slider (132) is at the end stop (127). The end stop (127) prevents the slider (132) from being removed from the fastening strips (130, 131) in the X axis (102). The fastening strips (130, 131) may have one, two, three or more ribs (140, 141). The slider (132) may have multiple protrusions (156).

WO 02/09549 A1

CLOSURE DEVICEFIELD OF THE INVENTION

5 The present invention relates generally to closure devices and, more particularly, to fastening strips and a slider. The invention is particularly well suited for fastening flexible storage containers, including plastic
10 bags.

BACKGROUND OF THE INVENTION

15 The use of closure devices for fastening storage containers, including plastic bags, is generally known. Furthermore, the manufacture of closure devices made of plastic materials is generally known to those skilled in the art, as demonstrated by the numerous patents in this area.

20 A particularly well-known use for closure devices is in connection with flexible storage containers, such as plastic bags. In some instances, the closure device and the associated container are formed from thermoplastic materials, and the closure device and the sidewalls of the
25 container are integrally formed by extrusion as a single piece. Alternatively, the closure device and sidewalls of the container may be formed as separate pieces and then connected by heat sealing or any other suitable connecting process. In either event, such closure devices are
30 particularly useful in providing a closure means for retaining matter within the bag.

Conventional closure devices typically utilize mating fastening strips or closure elements, which are used to selectively seal the bag. A slider may be provided for use in opening and closing the fastening strips. The slider may include a separator which extends at least partially between the fastening strips. When the slider is moved in the appropriate direction, the separator divides the fastening strips and opens the bag.

10

The slider is able to move along the fastening strips. However, the slider may be removed from the end of the fastening strips unless a system is provided to prevent removal. The present invention prevents removal of the slider from the end of the fastening strips.

15

SUMMARY OF THE INVENTION

According to the teachings of the present invention, the closure device includes interlocking fastening strips. The closure device also includes a slider slidably disposed on the interlocking fastening strips for facilitating the occlusion and deocclusion of the fastening strips when moved towards first and second ends of the fastening strips.

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The fastening strips include one or more ribs disposed laterally along the length of the fastening strips. The fastening strip includes an end stop at the end of the fastening strip. The slider engages the end stop and limits movement of the slider along the horizontal axis.

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The end stop prevents removal of the slider from the end of the fastening strips.

The objects, features, and advantages of the present invention will become more readily apparent upon reading the following detailed description of exemplified embodiments and upon reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

10

Fig. 1 is a perspective view of a container according to the present invention in the form of a plastic bag;

15 Fig. 2 is a fragmentary front view of the container in Fig. 1;

Fig. 3 is a cross sectional view taken along line 3-3 in Fig. 2;

20 Fig. 4 is a cross sectional view taken along line 4-4 in Fig. 2;

Fig. 5 is a cross sectional view of another embodiment of slider and fastening strips;

25

Fig. 6 is a cross sectional view of the fastening strips in Fig. 5 taken near the end of the fastening strips;

30 Fig. 7 is a cross sectional view of another embodiment of slider and fastening strips;

Fig. 8 is a cross sectional view of the embodiment in Fig. 7 taken near the end of the fastening strips;

5 Fig. 9 is a cross-sectional view of another embodiment of fastening strips and a slider;

Fig. 10 is a cross-sectional view of another embodiment of fastening strips and a slider; and

10

Fig. 11 is a cross-sectional view of another embodiment of fastening strips and a slider.

While the present invention will be described and
15 disclosed in connection with certain embodiments and procedures, the intent is not to limit the present invention to these embodiments and procedures.

DESCRIPTION OF THE EMBODIMENTS

20

Fig. 1 illustrates an embodiment of a container in the form of a plastic bag 120 having a sealable closure device 121. The bag 120 includes a first sidewall 122 and a second sidewall 123 joined at seams 125, 126 to define a
25 compartment accessible through the open top end but sealable by means of the closure device 121. The closure device 121 includes first and second fastening strips 130, 131 and a slider 132.

30 The fastening strips 130, 131 and the slider 132 have a longitudinal X axis 102, a transverse Y axis 104 and a

vertical Z axis 106. The transverse Y axis 104 is perpendicular to the longitudinal X axis 102. The vertical Z axis 106 is perpendicular to the longitudinal X axis 102 and the vertical Z axis 106 is perpendicular to the transverse Y axis 104.

The fastening strips 130, 131 are adapted to be interlocked between a first end 127 and a second end 128. The slider 132 is mounted onto the fastening strips 130, 131 so that the slider 132 is restrained from being removed from the fastening strips 130, 131 but free to slide along the X axis 102. The slider 132 engages the fastening strips 130, 131 so that when the slider 132 moves in an occlusion direction 114, the fastening strips 130, 131 interlock and the bag 120 is sealed, and when the slider 132 moves in a deocclusion direction 116, the fastening strips 130, 131 separate and the bag 120 is open. The slider engages the fastening strips along one or more ribs that extend laterally along the length of the fastening strips.

20

Figs. 2-3 illustrate front and cross sectional views of the container in Fig. 1. The first fastening strip 130 includes a first rib 140 and a second rib 141 that extend outward along the length of the first fastening strip 130. The first and second ribs 140, 141 may be disposed perpendicular to the Z axis 106. The ribs 140, 141 are separated by a gap 142. The slider 132 includes a protrusion 156 that is inserted into the gap 142.

The first fastening strip 130 may include a third rib 137 that is disposed below the first and second ribs. The

30

slider 132 is designed to engage the third rib 137. The third rib 137 prevents the slider 132 from being disengaged from the first fastening strip 130 in the direction of the Z axis 106. Additionally the third rib 137 provides a path
5 for the slider 132 to follow to facilitate the occlusion and deocclusion of the fastening strips.

The second fastening strip 131 includes a first rib 144 and a second rib 146 that extend outward along the
10 length of the second fastening strip 131. The first and second ribs 144, 146 may be disposed perpendicular to the Z axis 106. The ribs 144, 146 are separated by a gap 148. The slider 132 includes a protrusion 157 that is inserted into the gap 148.

15

The second fastening strip 131 may include a third rib 139 that is disposed below the first and second ribs. The slider 132 is designed to engage the third rib 139. The third rib 139 prevents the slider 132 from being disengaged
20 from the fastening strip 131 in the direction of the Z axis 106.

The slider generally comprises a first and second side portions 150, 151 and a top portion 152. The first side
25 portion 150 includes a first shoulder 154. Similarly, the second side portion 151 includes a second shoulder 155 that generally opposes the first shoulder 154. The shoulder 154 is designed to engage the fastening strips 130, 131 along the rib 137, providing a path for the slider 132 to follow
30 and preventing the slider from being disengaged from the fastening strip 130. Similarly the shoulder 155 is designed

to engage the rib 139 that is disposed on the fastening strip 131.

As shown in Fig. 3, the first side portion 150 may additionally include a first protrusion 156. The protrusion 156 engages the ribs 140, 141 disposed on the first fastening strip 130 and may prevent the slider 132 from being disengaged from the fastening strip 130. The second side portion 151 includes a second protrusion 157 that is designed to engage the ribs 144, 146 disposed on the second fastening strip 131. The protrusion 157 of the second side portion 151 engages the ribs 144, 146 disposed on the second fastening strip 131 and may prevent the slider 132 from being disengaged from the fastening strip 131.

15

Fig. 4 illustrates the fastening strips in Fig. 3 and depicts a cross section of the fastening strips taken at a location near one end of the closure device. The first fastening strip 130 includes an end stop 128. The end stop 128 may be formed by either: (1) altering the ribs 140, 141 to close or to reduce the size of the gap 142; and/or (2) adding material to the gap 142 to close the gap 142 or to reduce the size of the gap 142. The end stop 128 prevents the slider 132 from passing beyond the end stop and from being removed from the fastening strips in the X axis 102. Specifically, the protrusion on the slider will be unable to move past the end stop 128. The fastening strip 131 may include an end stop 129 which may be formed as noted above for end stop 128 and operates similar to end stop 128.

30

Figs. 5-6 depict another embodiment of fastening strips 230, 231 and slider 232. The fastening strips 230, 231 include first and second ribs 237, 239. The fastening strips 230, 231 include first and second flanges 246, 247. These
5 flanges may protrude downward from the closure elements. The first rib 237 and the flange 246 are separated by a gap 248. The second rib 239 and the flange 247 are separated by a gap 249.

10 The slider 232 includes a first side portion 250, a second side portion 251 and a top portion 252. The first and second side portions 250, 251 include first and second shoulders 254, 255, respectively. The first shoulder 254 includes a protrusion 258 that is designed to engage the gap
15 248. Similarly, the second shoulder 255 includes a protrusion 259 that engages the gap 249. The protrusions 258, 259 are designed to engage the gaps 248, 249 and prevent the slider from being disengaged from the fastening strips 130, 131 in the Z axis 106.

20

The first fastening strip 230 may include an end stop 228. The end stop 228 may be formed by either: (1) altering the rib 237 to close the gap 248 or to reduce the size of the gap 248; and/or (2) adding material to the gap
25 248 to close the gap 248 or to reduce the size of the gap 248. The end stop 228 prevents the slider 232 from passing beyond the end stop 228 and from being removed from the fastening strips in the X axis 102. Specifically, the protrusion 258 will be unable to move past the end stop 228.
30 The second fastening strip 231 may include an end stop 229

which may be formed as noted above for end stop 228 and operates similar to end stop 228.

Figs. 7 and 8 depict another embodiment of fastening strips 330, 331 and a slider 332. The first fastening strip 330 includes a first rib 336 and a second rib 338 that extend outward along the length of the fastening strip 330. The first and second ribs 336, 338 may be disposed perpendicular to the Z axis 106. The ribs 336, 338 are separated by a gap 339. The slider 332 includes a protrusion 356 that is inserted in the gap 339.

The second fastening strip 331 may include a first rib 340 and a second rib 341 that extend outward along the length of the fastening strip 331. The first and second ribs 340, 341 may be disposed perpendicular to the Z axis 106. The ribs 340, 341 are separated by a gap 342. The slider 332 includes a protrusion 357 that is inserted in the gap 342.

20

The slider 332 includes a first side portion 350, a second side portion 351 and a top portion 352. The first and second side portions 350, 351 include first and second protrusions 356, 357 that engage the gaps 339, 342 formed between the ribs 336, 338, 340, 341 and prevent the slider from being disengaged from the fastening strips. The first fastening strip 330 includes an end stop 328. The end stop 328 may be formed by either: (1) altering the ribs 336, 338 to close the gap 339 or to reduce the size of the gap 339; and/or (2) adding material to the gap 339 to close the gap 339 or to reduce the size of the gap 339. The end stop 328

30

prevents the slider 332 from passing beyond the end stop 328 and from being removed from the fastening strips in the X axis 102. Specifically, the protrusion 356 on the slider will be unable to move past the end stop 328. The second
5 fastening strip 331 may include an end stop 329 which may be formed as noted for end stop 328 and operates similar to end stop 328.

In keeping with a general aspect of the present
10 invention and as will be described in greater detail below, the interlocking fastening strips may be of different types or forms.

As shown in Fig. 9, the fastening strips may be U-channel
15 fastening strips as described in U.S. Patent 4,829,641. U-channel fastening strips include a first fastening strip 430 with a first closure element 436 and a second fastening strip 431 with a second closure element 434. The first closure element 436 engages the second closure element 434. The first
20 fastening strip 430 may include a flange 463 disposed at the upper end of the first fastening strip 430 and a rib 467 disposed at the lower end of the first fastening strip 430. The first fastening strip 430 may include a flange portion 469. Likewise, the second fastening strip 431 may include a
25 flange 453 disposed at the upper end of the second fastening strip 431 and a rib 457 disposed at the lower end of the second fastening strip 431. The second fastening strip 431 may include a flange portion 459. The side walls 422, 423 of the plastic bag 420 may be attached to the fastening strips
30 430, 431 by conventional manufacturing techniques.

The second closure element 434 includes a base portion 438 having a pair of spaced-apart parallelly disposed webs 440, 441, extending from the base portion 438. The base and the webs form a U-channel closure element. The webs 440, include
5 hook closure portions 442, 444 extending from the webs 440, 441 respectively, and facing towards each other. The hook closure portions 442, 444 include guide surfaces 446, 447 which serve to guide the hook closure portions 442, 444 for occluding with the hook closure portions 452, 454 of the first
10 closure element 436.

The first closure element 436 includes a base portion 448 including a pair of spaced-apart, parallelly disposed webs 450, 451 extending from the base portion 448. The base and the
15 webs form a U-channel closure element. The webs 450, 451 include hook closure portions 452, 454 extending from the webs 450, 451 respectively and facing away from each other. The hook closure portions 452, 454 include guide surfaces 445, 455, which generally serve to guide the hook closure portions
20 452, 454 for occlusion with the hook closure portions 442, 444 of the second closure element 434. The guide surfaces 445, 455 may also have a rounded crown surface.

The slider 432 includes a top portion 472. The top
25 portion provides a separator 443 having a first end and a second end wherein the first end may be wider than the second end. In addition, the separator 443 may be triangular in shape. When the slider is moved in the occlusion direction, the separator 443 deoccludes the fastening strips 430, 431 as
30 shown in Fig. 9. Referring to Fig. 9, the closure elements 434, 436 are deoccluded and specifically, the upper hook

portions 442, 452 and the lower hook portions 444, 454 are deoccluded.

The interlocking fastening strips may comprise
5 "arrowhead-type" or "rib and groove" fastening strips as shown
in Fig. 10 and as described in U.S. Patent 3,806,998. The rib
element 505 interlocks with the groove element 507. The rib
element 505 is of generally arrow-shape in transverse cross
section including a head 510 comprising interlock shoulder
10 hook portions 511 and 512 generally convergently related to
provide a cam ridge 513 generally aligned with a stem flange
514 by which the head is connected in spaced relation with
respect to the supporting flange portion 508. (U.S. Patent
3,806,998, Col. 2, lines 16-23). At their surfaces nearest
15 the connecting stem flange 514, the shoulder portions 511 and
512 define reentrant angles therewith providing interlock
hooks engageable with interlock hook flanges 515 and 517
respectively of the groove element 507. (U.S. Patent
3,806,998, Col. 2, lines 23-28). Said hook flanges generally
20 converge toward one another and are spread open to receive the
head 510 therebetween when said head is pressed into said
groove element 507 until the head is fully received in a
groove 518 of said groove element 507 generally complementary
to the head and within which the head is interlocked by
25 interengagement of the head shoulder hook portions 511 and 512
and the groove hook flanges 515 and 517. (U.S. Patent
3,806,998, Col. 2, lines 28-36). Through this arrangement, as
indicated, the head and groove elements 505 and 507 are
adapted to be interlockingly engaged by being pressed together
30 and to be separated when forcably pulled apart, as by means of

a generally U-shaped slider 519. (U.S. Patent 3,806,998, Col. 2, lines 36-41).

The slider 519 includes a flat back plate 520 adapted to
5 run along free edges 521 on the upper ends of the sections of
the flange portions 508 and 509 as shown in the drawing.
(U.S. Patent 3,806,998, Col. 2, lines 41-46). Integrally
formed with the back plate 520 and extending in the same
direction (downwardly as shown) therefrom are respective
10 coextensive side walls 522 with an intermediate spreader
finger 523 extending in the same direction as the side walls
at one end of the slider. (U.S. Patent 3,806,998, Col. 2,
lines 46-51). The side walls 522 are in the form of panels
which are laterally divergent from a narrower end of the
15 slider. (U.S. Patent 3,806,998, Col. 2, lines 51-55). The
slider walls 522 are each provided with an inwardly
projecting shoulder structure 524 flange adapted to engage
respective shoulder ribs 525 and 527 on respectively outer
sides of the lower section of the flange portions 508 and
20 509. (U.S. Patent 3,806,998, Col. 2, line 66 to Co. 3, line
3).

The fastening strips in FIG. 10 may include one of the
end stop embodiments noted above.

25

Additionally, the interlocking fastening strips may
comprise "profile" fastening strips, as shown in Fig. 11 and
described in U.S. Patent 5,664,299. As shown in FIG. 11, the
first profile 616 has at least an uppermost closure element
30 616a and a bottommost closure element 616b. (U.S. Patent
5,664,299, Col. 3, lines 25-27). The closure elements 616a

and 616b project laterally from the inner surface of strip 614. (U.S. Patent 5,664,299, Col. 3, lines 27-28). Likewise, the second profile 617 has at least an uppermost closure element 617a and a bottommost closure element 617b. (U.S. Patent 5,664,299, Col. 3, lines 28-30). The closure elements 617a and 617b project laterally from the inner surface of strip 615. (U.S. Patent 5,664,299, Col. 3, lines 30-32). When the bag is closed, the closure elements of profile 616 interlock with the corresponding closure elements of profile 617. (U.S. Patent 5,664,299, Col. 3, lines 32-34). As shown in FIG. 19, closure elements 616a, 616b, 617a and 617b have hooks on the ends of the closure elements, so that the profiles remain interlocked when the bag is closed, thereby forming a seal. (U.S. Patent 5,664,299, Col. 3, lines 34-37).

15

The straddling slider 610 comprises an inverted U-shaped member having a top 620 for moving along the top edges of the strips 614 and 615. (U.S. Patent 5,664,299, Col. 4, lines 1-3). The slider 610 has side walls 621 and 622 depending from the top 620. (U.S. Patent 5,664,299, Col. 4, lines 3-4). A separating leg 623 depends from the top 620 between the side walls 621 and 622 and is located between the uppermost closure elements 616a and 617a of profiles 616 and 617. (U.S. Patent 5,664,299, Col. 4, lines 26-30). The fastening assembly includes ridges 625 on the outer surfaces of the fastening strips 614 and 615, and shoulders 621b and 622b on the side walls of the slider. (U.S. Patent 5,664,299, Col. 4, lines 62-65). The shoulders act as means for maintaining the slider in straddling relation with the fastening strips by grasping the lower surfaces of the ridges 625. (U.S. Patent 5,664,299, Col. 5, lines 4-7).

30

The fastening strips in FIG. 11 may include one of the end stop embodiments noted above.

5 Also, the interlocking fastening strips may be "rolling
action" fastening strips as shown in Fig. 12 and described in
U.S. Patent 5,007,143. The strips 714 and 715 include
profiled tracks 718 and 719 extending along the length thereof
parallel to the rib and groove elements 716 and 717 and the
10 rib and groove elements 716, 717 have complimentary cross-
sectional shapes such that they are closed by pressing the
bottom of the elements together first and then rolling the
elements to a closed position toward the top thereof. (U.S.
Patent 5,007,143, Col. 4, line 62 to Col. 5, line 1). The rib
15 element 716 is hook shaped and projects from the inner face of
strip 714. (U.S. Patent 5,007,143, Col. 5, lines 1-3). The
groove element 717 includes a lower hook-shaped projection
717a and a relatively straight projection 717b which extend
from the inner face of strip 715. (U.S. Patent 5,007,143,
20 Col. 5, lines 3-6). The profiled tracks 718 and 719 are
inclined inwardly toward each other from their respective
strips 714 and 715. (U.S. Patent 5,007,143, Col. 5, lines 6-
8).

25 The straddling slider 710 comprises an inverted U-shaped
plastic member having a back 720 for moving along the top
edges of the tracks 718 and 719 with side walls 721 and 722
depending therefrom for cooperating with the tracks and
extending from an opening end of the slider to a closing end.
30 (U.S. Patent 5,007,143, Col. 5, lines 26-31). A separator
finger 723 depends from the back 720 between the side walls

721 and 722 and is inserted between the inclined tracks 718 and 719. (U.S. Patent 5,007,143, Col. 5, lines 34-36). The slider 710 has shoulders 721a and 722a projecting inwardly from the depending side walls 721 and 722 which are shaped
5 throughout the length thereof for cooperation with the depending separator finger 723 in creating the rolling action in opening and closing the reclosable interlocking rib and groove profile elements 716 and 717. (U.S. Patent 5,007,143, Col. 5, lines 43-49).

10

The fastening strips in FIG. 12 may include one of the end stop embodiments noted above.

Although several interlocking fastening strip
15 embodiments have been specifically described and illustrated herein, it will be readily appreciated by those skilled in the art that other kinds, types, or forms of fastening strips may be used without departing from the scope or spirit of the present invention.

20

The interlocking fastening strips may be manufactured by extrusion through a die. The interlocking fastening strips may be formed from any suitable thermoplastic material including, for example, polyethylene,
25 polypropylene, nylon, or the like, or from a combination thereof. Thus, resins or mixtures of resins such as high density polyethylene, medium density polyethylene, and low density polyethylene may be employed to prepare the interlocking fastening strips. For example, the fastening
30 strips may be made from low density polyethylene.

When the fastening strips are used in a sealable bag, the fastening strips and the films that form the body of the bag may be conveniently manufactured from heat sealable material. In this way, the bag may be economically formed by
5 using an aforementioned thermoplastic material and by heat sealing the fastening strips to the bag. For example, the bag may be made from a mixture of high pressure, low density polyethylene and linear, low density polyethylene.

10 The fastening strips may be manufactured by extrusion or other known methods. For example, the closure device may be manufactured as individual fastening strips for later attachment to the bag or may be manufactured integrally with the bag. In addition, the fastening strips may be
15 manufactured with or without flange portions on one or both of the fastening strips depending upon the intended use of the fastening strips or expected additional manufacturing operations.

20 The end stops may be created through heat sealing, ultrasonic sealing, or similar known methods that may melt the ribs. Additionally, the ribs may be flattened using cold forming.

25 The fastening strips can be manufactured in a variety of forms to suit the intended use. The fastening strips may be integrally formed on the opposing sidewalls of the container or bag, or connected to the container by the use of any of many known methods. For example, a thermoelectric
30 device may be applied to a film in contact with the flange portion of the fastening strips or the thermoelectric device

may be applied to a film in contact with the base portion of fastening strips having no flange portion, to cause a transfer of heat through the film to produce melting at the interface of the film and a flange portion or base portion of the fastening strips. Suitable thermoelectric devices include heated rotary discs, traveling heater bands, resistance-heated slide wires, and the like. The connection between the film and the fastening strips may also be established by the use of hot melt adhesives, hot jets of air to the interface, ultrasonic heating, or other known methods. The bonding of the fastening strips to the film stock may be carried out either before or after the film is U-folded to form the bag. In any event, such bonding is done prior to side sealing the bag at the edges by conventional thermal cutting. In addition, the first and second fastening strips may be positioned on opposite sides of the film. Such an embodiment would be suited for wrapping an object or a collection of objects such as wires. The first and second fastening strips should may be positioned on the film in a generally parallel relationship with respect to each other, although this will depend on the intended use.

The slider may be multiple parts and snapped together. In addition, the slider may be made from multiple parts and fused or welded together. The slider may also be a one piece construction. The slider can be colored, opaque, translucent or transparent. The slider may be injection molded or made by any other method. The slider may be molded from any suitable plastic material, such as, nylon, polypropylene, polystyrene, acetal, toughened acetal, polyketone,

polybutylene terephthalate, high density polyethylene, polycarbonate or ABS (acrylonitrile-butadiene-styrene).

From the foregoing it will be understood that
5 modifications and variations may be effectuated to the disclosed structures particularly in light of the foregoing teachings - without departing from the scope or spirit of the present invention. As such, no limitation with respect to the specific embodiments described and illustrated herein
10 is intended or should be inferred. In addition, all references and copending applications cited herein are hereby incorporated by reference in their entireties.

WHAT IS CLAIMED IS:

1. A closure device, comprising:

first and second interlocking fastening strips arranged to be interlocked over a predetermined length between first and second ends, the first fastening strip includes a first rib that extends along the first fastening strip;

a slider slidably disposed on the fastening strips for movement between the first and second ends, the slider facilitating occlusion of the fastening strips when moved towards one end, the slider facilitating the deocclusion of the fastening strips when the slider is moved towards the other end, the slider including a first protrusion that engages the first rib; and

the first fastening strip includes a first end stop near the first rib, the first protrusion engages the first end stop when the slider is at the first end stop.

2. The invention as in claim 1 wherein the first end stop was created by altering the first rib.

3. The invention as in claim 1 wherein the first end stop was created by adding material near the first rib.

4. The invention as in claim 1 wherein the first fastening strip has a second rib.

5. The invention as in claim 4 wherein the first rib and the second rib are separated by a first gap.

6. The invention as in claim 5 wherein the first protrusion is disposed in the gap.

7. The invention as in claim 6 wherein the first end stop is disposed in the gap.

8. The invention as in claim 4 wherein the first fastening strip has a third rib.

9. The invention as in claim 1 wherein the slider includes a first shoulder, the first protrusion is the first shoulder.

10. The invention as in claim 1 wherein the slider includes a first shoulder, the first shoulder includes the first protrusion.

11. The invention as in claim 1 wherein the slider includes a first side portion, the first protrusion is disposed on the first side portion.

12. The invention as in claim 1 wherein the first fastening strip has a flange portion.

13. The invention as in claim 12 wherein the first rib and the flange portion are separated by a gap.

14. The invention as in claim 13 wherein the first protrusion is disposed in the gap.

15. The invention as in claim 13 wherein the first end stop is disposed in the gap.

16. The invention as in claim 1 wherein the first end stop is near the first end.

17. The invention as in claim 1 wherein the first end stop is near the second end.

18. The invention as in claim 1 wherein the first fastening strip includes a second end stop near the first rib, the first protrusion engages the first end stop when the slider is at the second end stop.

19. The invention as in claim 1 wherein the second fastening strip includes a second rib, the slider includes a second protrusion which engages the second rib, the second fastening strip includes a second end stop near the first rib, the second protrusion engages the second end stop when the slider is at the first end stop.

20. The invention as in claim 1 wherein the first fastening strip includes a first closure element, the second fastening strip includes a second closure element.

21. The invention as in claim 17 wherein the first closure element includes a first web and a first hook, the

second closure element includes a second web and a second hook.

22. A container comprising:

first and second sidewalls including first and second fastening strips respectively,

first and second interlocking fastening strips arranged to be interlocked over a predetermined length between first and second ends, the first fastening strip includes a first rib that extends along the first fastening strip;

a slider slidably disposed on the fastening strips for movement between the first and second ends, the slider facilitating occlusion of the fastening strips when moved towards one end, the slider facilitating the deocclusion of the fastening strips when the slider is moved towards the other end, the slider including a first protrusion that engages the first rib; and

the first fastening strip includes a first end stop near the first rib, the first protrusion engages the first end stop when the slider is at the first end stop.

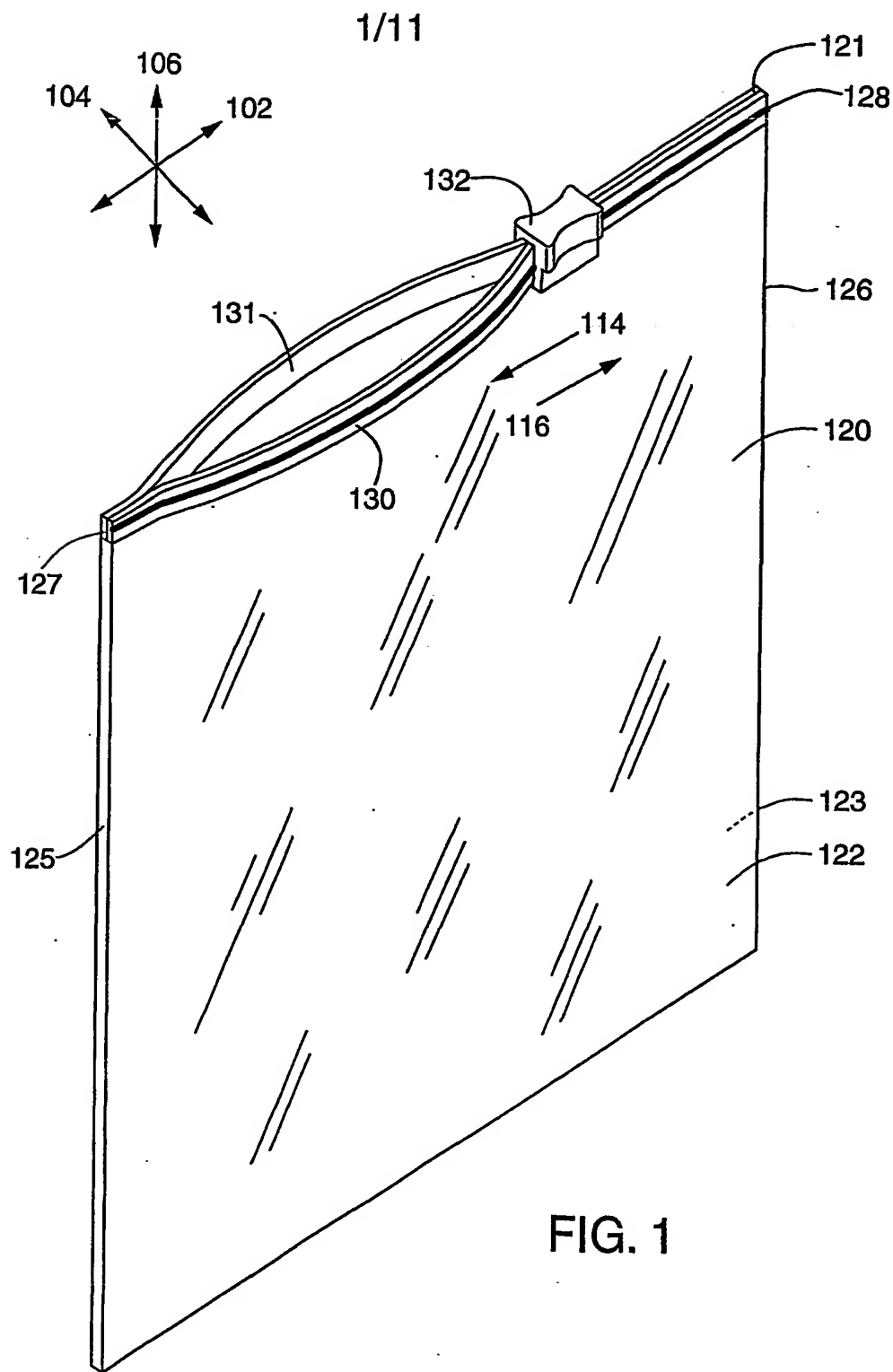
23. A method of manufacturing a closure device, comprising:

providing first and second interlocking fastening strips arranged to be interlocked over a predetermined length between first and second ends, the first fastening strip includes a first rib that extends along the first fastening strip;

providing a slider slidably disposed on the fastening strips for movement between the first and second ends, the

slider facilitating occlusion of the fastening strips when moved towards one end, the slider facilitating the deocclusion of the fastening strips when the slider is moved towards the other end, the slider including a first protrusion that engages the first rib; and

providing the first fastening strip includes a first end stop near the first rib, the first protrusion engages the first end stop when the slider is at the first end stop.



2/11

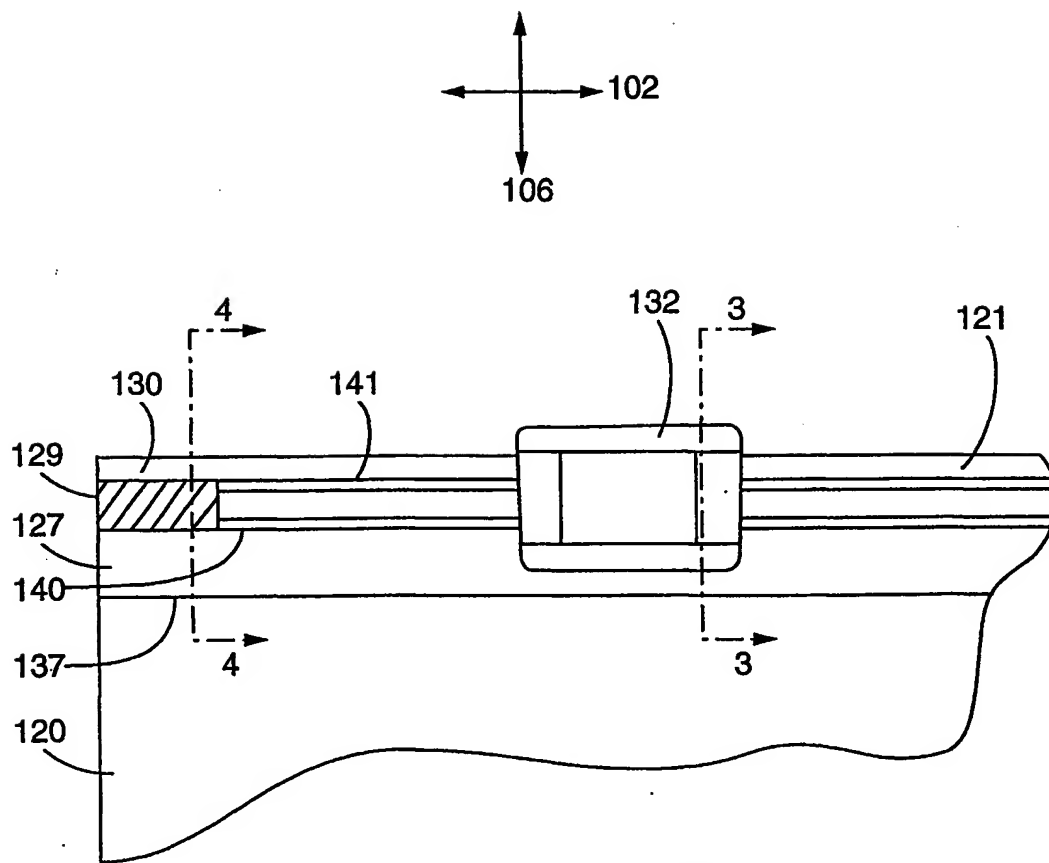


FIG. 2

3/11

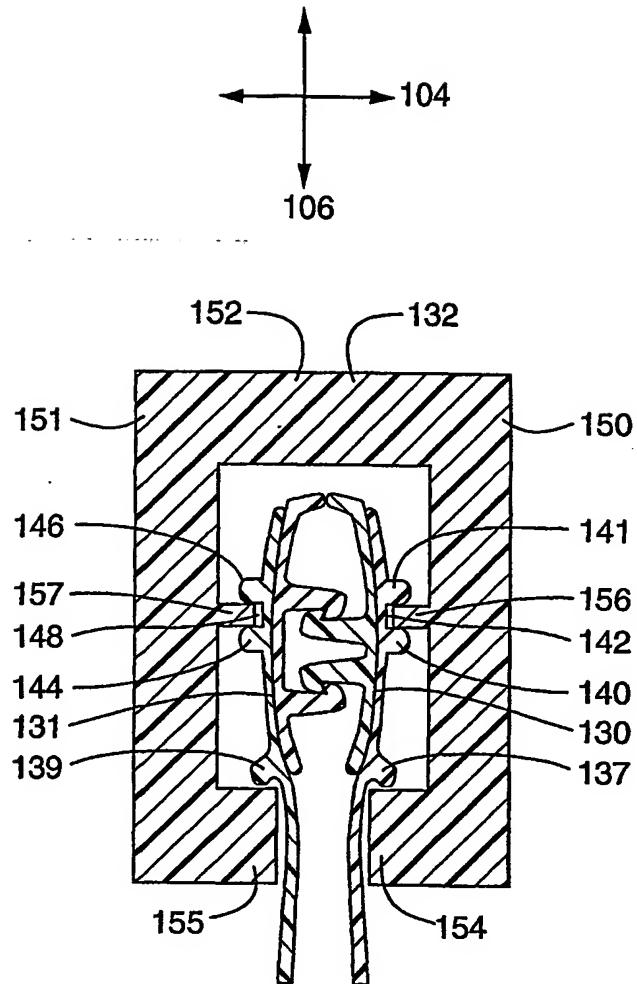


FIG. 3

4/11

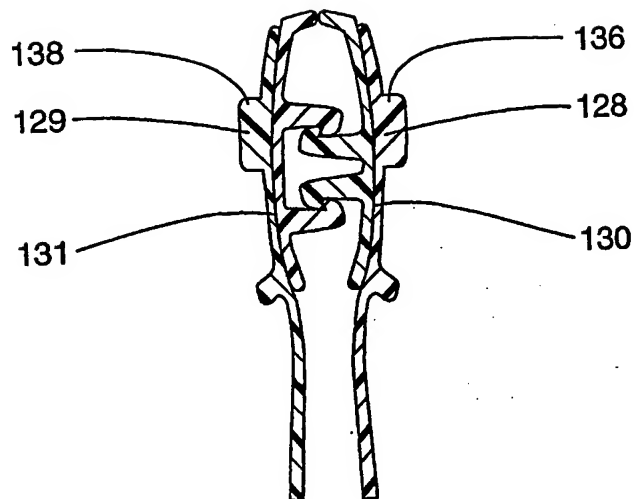
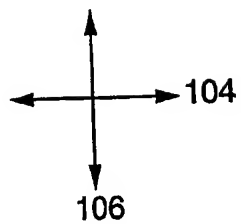


FIG. 4

5/11

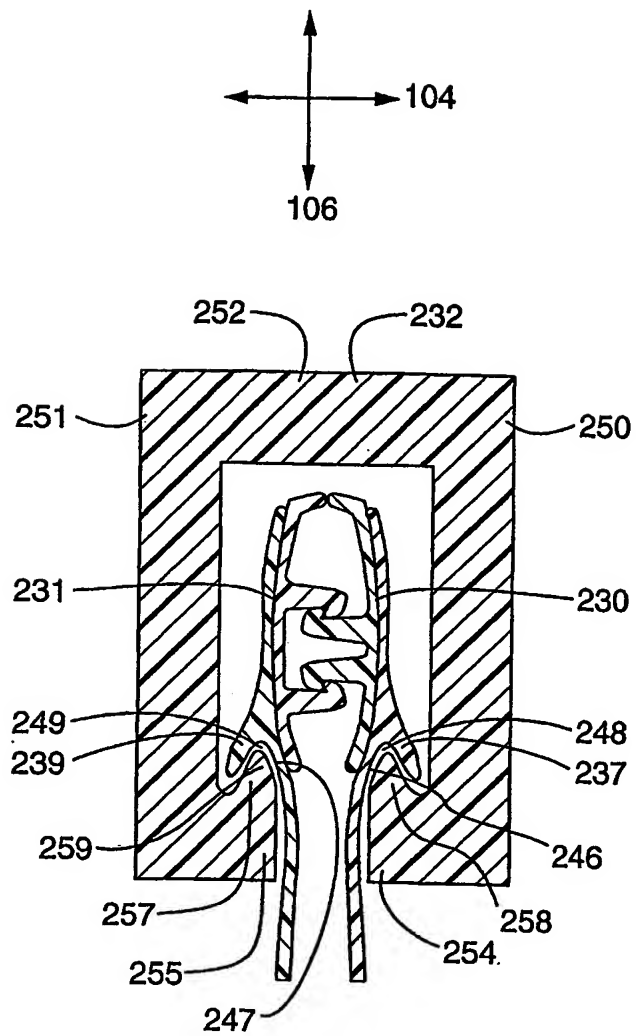


FIG. 5

6/11

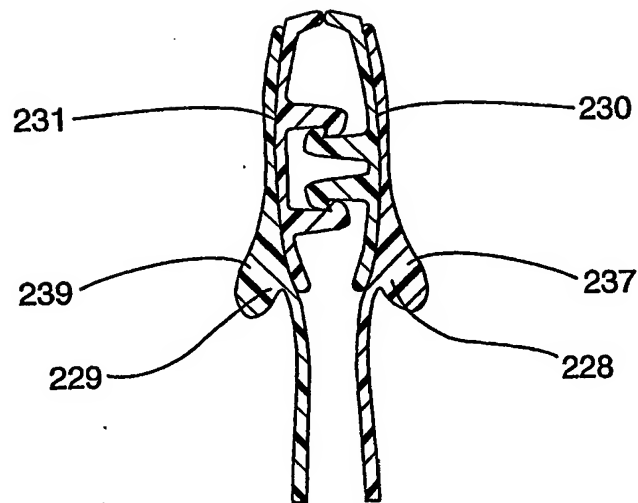
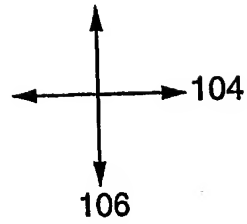


FIG. 6

7/11

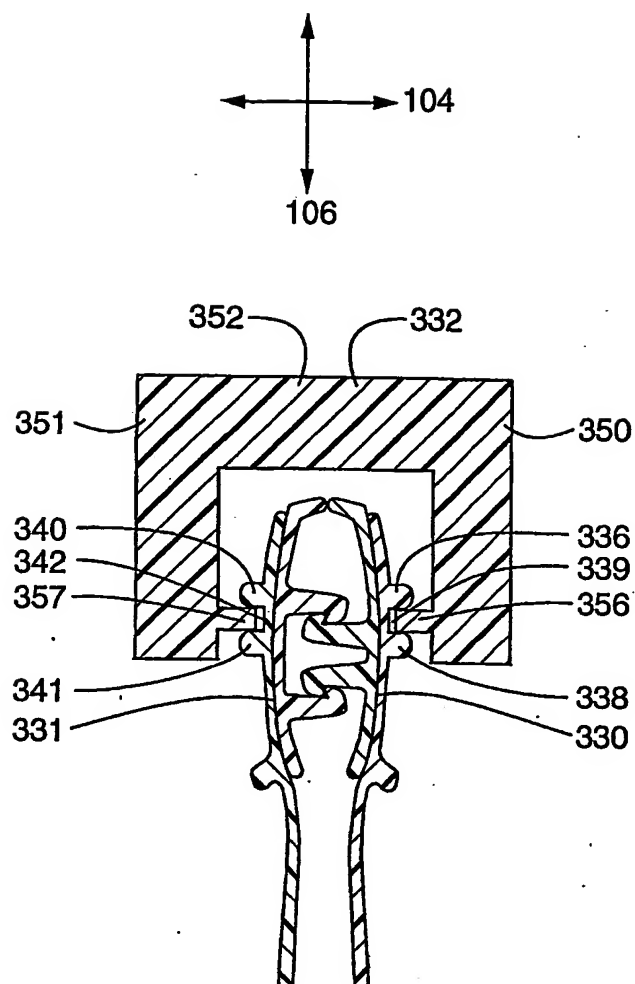


FIG. 7

8/11

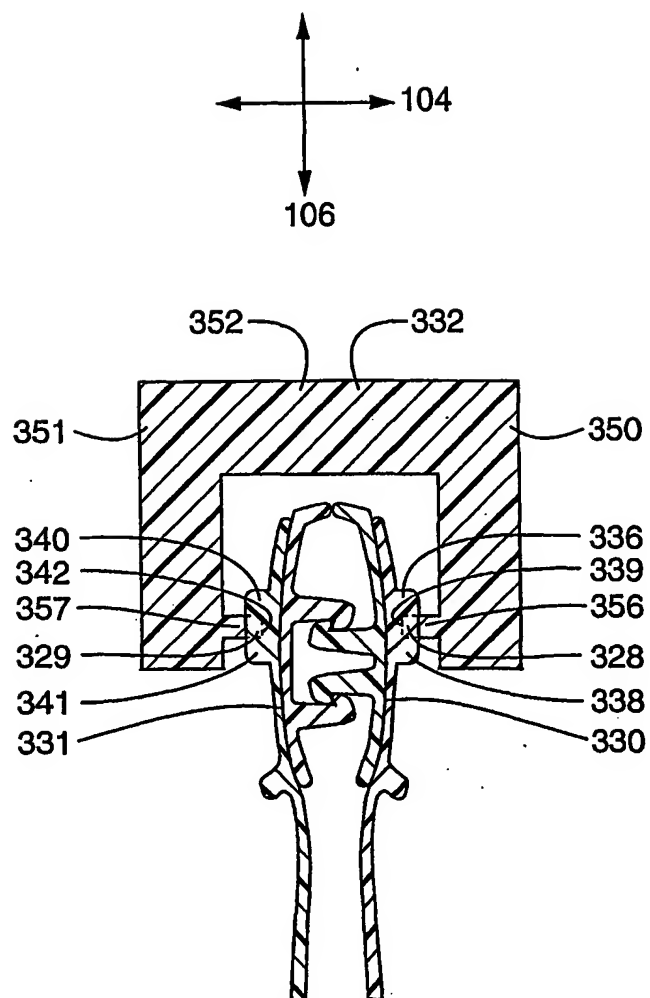


FIG. 8

9/11

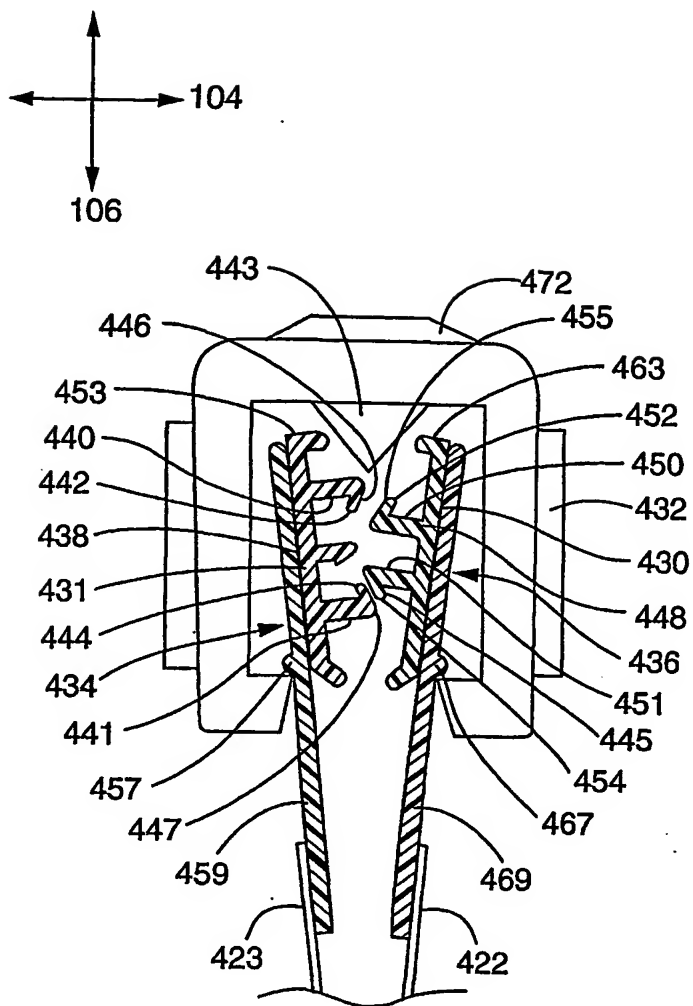


FIG. 9

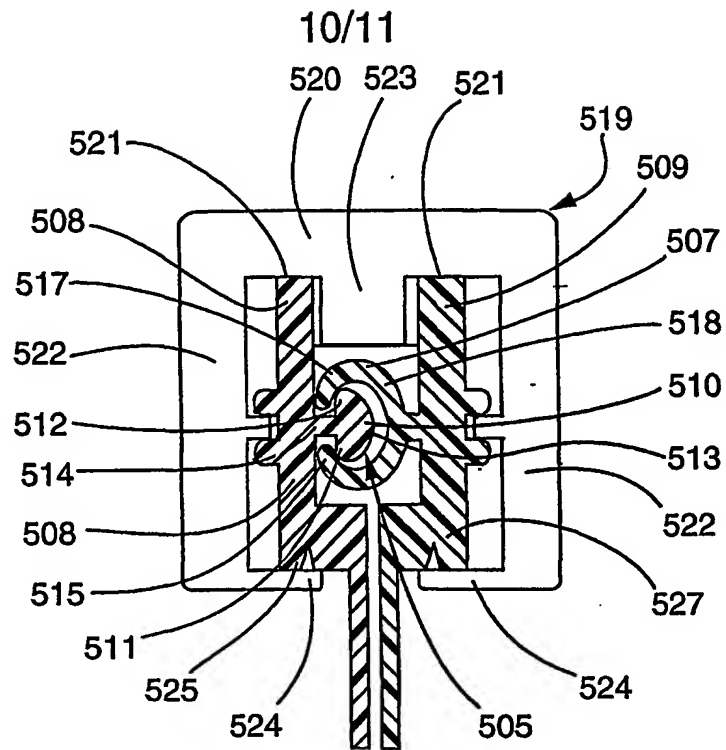


FIG. 10

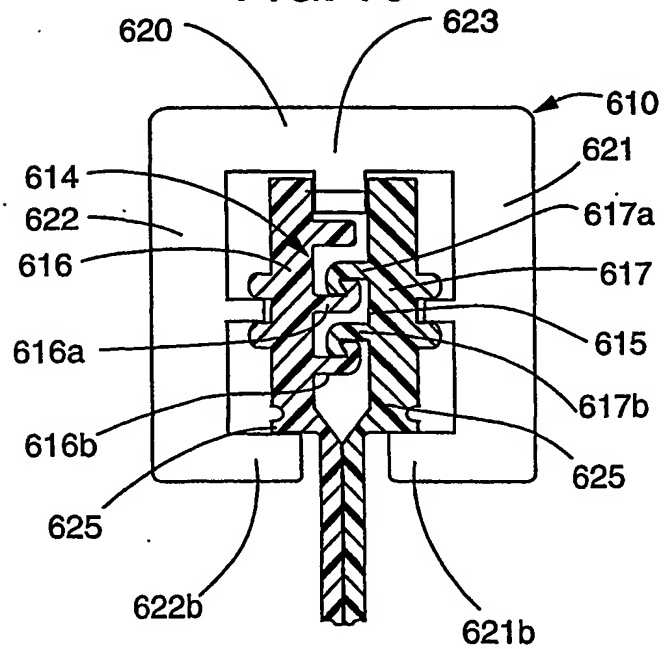


FIG. 11

11/11

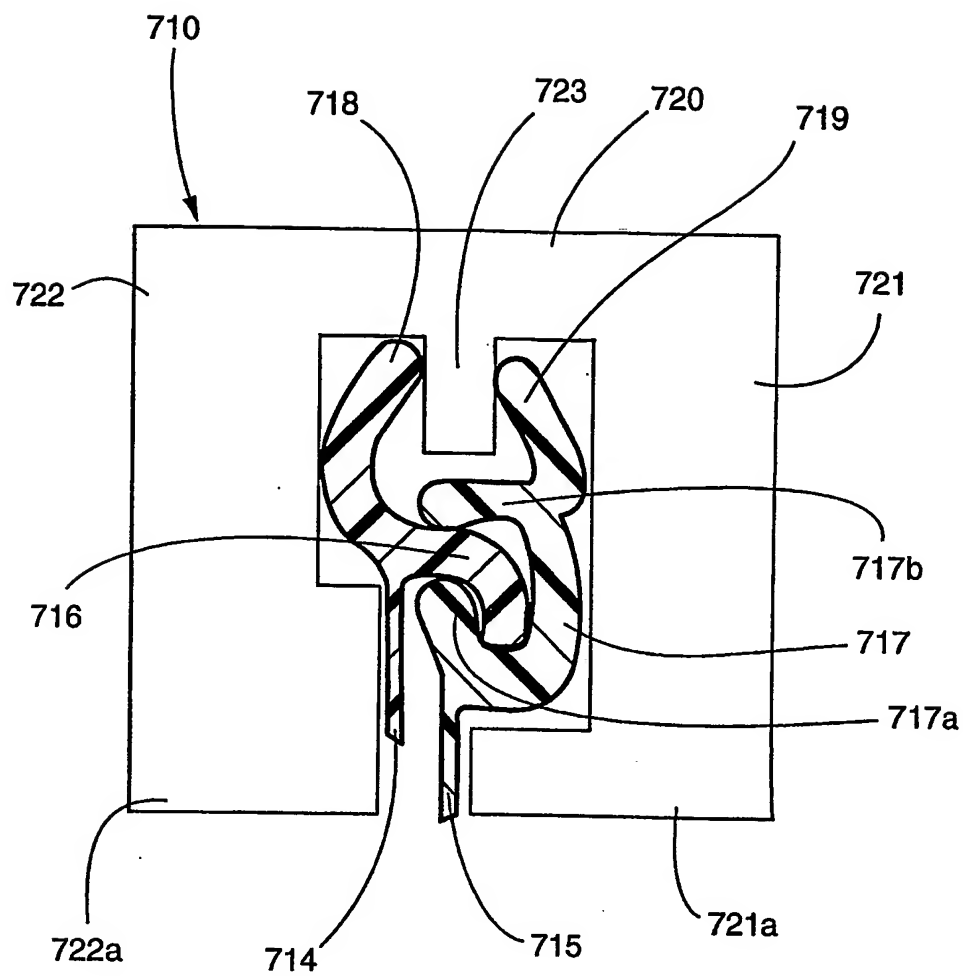


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/20422

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A44B 19/16 ; B65D 33/16, B65D 33/24

US CL : 24/399, 387, 427, 400, 587 ; 383/63, 64

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 24/399, 387, 427, 400, 587, 415, 389, 435 ; 383/63, 64, 65

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| Y | US 5,636,415 A (JAMES) 10 JUNE 1997 ; SEE THE ENTIRE DOCUMENT . | 1-23 |
| Y | US 5,924,173 A (DOBRESKI ET AL) 20 JULY 1999 ; SEE THE ENTIRE DOCUMENT . | 1-23 |
| Y | US 5,664,299 A (PORCHIA ET AL) 09 SEPTEMBER 1997 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |
| Y | US 5,489,252 A (MAY) 06 FEBRUARY 1996 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |
| Y | US 5,189,764 A (HERRINGTON ET AL) 02 MARCH 1993 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |
| Y | US 3,806,998 A (LAGUERRE) 30 APRIL 1974 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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| *B* earlier document published on or after the international filing date | *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
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| *O* document referring to an oral disclosure, use, exhibition or other means | |
| *P* document published prior to the international filing date but later than the priority date claimed | |

Date of the actual completion of the international search

11 OCTOBER 2000

Date of mailing of the international search report

20 NOV 2000

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/20422

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|---|--|-----------------------|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| Y | US 4,829,641 A (WILLIAMS) 16 MAY 1989 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |
| Y | US 5,007,143 A (HERRINGTON) 16 APRIL 1991 ; SEE THE ENTIRE DOCUMENT . | 1 - 23 |
| Y | WO 2,020,252 A (HERRINGTON ET AL) 26 NOVEMBER 1992 ; SEE THE ENTIRE DOCUMENT . | 1 -23 |